The non-handling of climate change uncertainties in strategic environmental assessment of urban planning

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Abstract

Strategic Environmental Assessment (SEA), which in the European context is governed by the EU Directive "*on the assessment of the effects of certain plans and programmes on the environment*" from 2001, has been pointed out as a relevant area of focus when dealing with climate change, also in urban planning. In the European context integration of climate change in SEA is also legally required. Further comes that potential uncertainty, e.g. in relation to climate change should be addressed in the SEA report. However, studies sow doubt about whether these demands are being met. Against this backdrop, this paper aims to contribute to our understanding of whether and how actors deal with climate change uncertainty in SEA, and seeks to explore the following question:

- How is climate change uncertainty dealt with in SEA of urban planning in practice in Denmark?

For this purpose an analysis of Danish SEA reports is carried out, with a focus on the mandatory consideration of uncertainties. The analysis shows that SEA practice in urban planning to a large extent does not explicitly deal with uncertainties. This leads to a discussion about mechanisms behind avoiding climate change uncertainties, based on literature and reflections on practice. The avoidance of uncertainties is distinguished into the following strategies: Denying uncertainty, ignoring uncertainty and finally postponing consideration of uncertainty. Further two possible reasons behind avoiding uncertainty are proposed: Conflict avoidance and reliance on quantification.

1. The links between SEA, climate change and uncertainty

The IPCC has defined climate change as "*a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity*" (Bernstein et al. 2007, p. 30). Present and future climate change is currently assessed by the IPCC as real and probably caused by society's increasing emissions of GHGs (Barker et al. 2007) and it is perceived by many to be one of the most important environmental problems we face today. There are two overall approaches which society could adopt to counter the negative effects of climate change; mitigation and adaptation. According to Bernstein et al. (2007, p. 56): "*Societies can respond to climate change by adapting to its impacts and by reducing GHG emissions*

(mitigation), thereby reducing the rate and magnitude of change". Further "*adaptation measures will be required at regional and local levels to reduce the adverse impacts of projected climate change and variability, regardless of the scale of mitigation undertaken over the next two to three decades*" (Bernstein et al. 2007, p. 56).

Within the planning discipline there are several examples of the perception that spatial planning is an important tool in regards to climate change; both mitigation and adaptation (see e.g. Briesbroek 2009; Bulkeley 2006; Hamin and Gurran 2009; Wilson 2006). It is suggested that spatial planning can contribute to mitigation measures in the form of lesser energy use for transport and heating/cooling buildings and to adaptation through making built and natural environments more resilient to the consequences of climate change. Specific examples of the tools or strategies that can be used within spatial planning to mitigate or adapt to climate change are shown in Figure 1.

Mitigation	**Adaptation**
Denser urban areas	Choice of building materials and design
Mixed use areas	Design of rainwater/sewage systems
Easy access to public transport	Localisation away from flooding/storm risk areas
Use of renewable energy	Making space for biodiversity

Figure 1 (Hamin and Gurran 2009; Bulkeley 2006; Riley 2000)

Thus it is clear that there are many good intentions regarding spatial planning as a tool in the effort against the negative consequences of climate change. Also there are clear potentials for spatial planning in this regard, however it is debated whether this potential is actually being utilised: "*Despite the increased rhetoric about the importance of addressing climate protection at local and regional levels, questions remain as to how this rhetoric is being translated in the realities of spatial planning policy*" (Bulkeley 2006).

Strategic environmental assessment (SEA) provides a systematic framework to assess the potential environmental impacts of proposed policies, plans and programmes[1] and using this framework to continuously make plans more sustainable (Therivel 2004; Kørnøv and Christensen 2007). SEA is used in a variety of sectors e.g. agriculture, water, forestry, waste management, industry and urban planning, and by a variety of actors e.g. state agencies, local authorities, private companies and donor agencies (UN University and Oxford Brookes University n.d.). In 2001 the *Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment* was passed by the EU (Directive 2001/42/EC 2001). The Directive was implemented in Danish legislation in 2004 through the *Law on environmental assessment of plans and*

[1] For the sake of simplicity the different forms of strategic actions covered by SEA are from now on referred to as plans

programmes[2]. (LBK nr 1398 2007; LOV nr 250 2009) The purpose of the law, and subsequently of SEA, is to *"secure a high level of environmental protection and to contribute to the integration of environmental considerations during the preparation and approval of plans and programmes with a view to promoting sustainable development through securing preparation of an environmental assessment of plans and programmes which have potentially significant impacts on the environment*" (LOV nr 250 2009). According to the law, an SEA report is to be prepared for certain plans. The report should predict and assess the likely environmental impacts of the plan and reasonable alternatives, with the purpose of improving the possibilities of assessing which solutions are most expedient in a sustainability framework and improve the plan. (LBK nr 1398 2007, §7; VEJ nr 9664 2006, p. 3) Part of the purpose of the SEA process and reports is also to enhance transparency of environmental issues and discussions for stakeholders and the public (Therivel 2004; Kørnøv and Christensen 2007).

SEA is seen by some as holding a potential to secure timely integration of climate change into planning and thus urban spatial planning, through the systematic assessment of climate change impacts. Much of the literature on impact assessment and climate change points to at least two approaches; Mitigation and adaptation, which can be defined as follows:

Mitigation: What are the expected emissions of greenhouse gasses resulting from the project and how can they be reduced?

Adaptation: How may the project be impacted by the consequences of climate change and how can the project be adapted to this?

(Larsen and Kørnøv 2009)

A specific challenge concerning climate change is that particularly the consequences of climate change are uncertain (Willows and Connell 2003; Erhard 2008; Bernstein et al. 2007). The Meteorological Institute of Denmark (n.d) state that "*in practice it* [climate change prediction] *is a very difficult task since the climate models are not nearly detailed enough to describe all elements of the real world*". In the report "*Impacts of Europe's Changing Climate*" from the European Environment Agency, the uncertainties regarding climate change are expressed, for instance, in relation to how the climate system functions and how the driving forces of society will develop and affect climate change (Erhard 2008). The IPCC also describes uncertainties in relation to climate change; for instance, how "*uncertainty in the carbon cycle feedback creates uncertainty in the emissions trajectory required to achieve a particular stabilisation level*" (Bernstein et al. 2007, p.73). In relation to responses to climate change the IPCC also delves into the uncertainties related to how planners will integrate knowledge of climate change in their decision, and what the institutional, political and financial constraints for adaptation will be (Bernstein et al. 2007).

For SEA which seeks to predict and assess environmental impacts uncertainty is a relevant challenge that needs to be addressed (see e.g. Tennøy, Kværner and Gjerstad, 2006; Thissen and Agusdinata 2008). This

[2] The law has been amended since, last time in 2009.

fact is underlined by the legislation which states that SEA reports should include "*an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information*" (European Parliament and Council of the European Union 2001, Annex 1 (j)). One of the difficulties encountered in an assessment may be uncertainty in different forms, including the uncertainty of the consequences of climate change in relation to the plan or programme. In spite of this it has been questioned whether uncertainty is handled sufficiently in impact assessment. Tennøy, Kværner and Gjerstad (2006) for example, found in a study of 22 Norwegian cases of environmental impact assessment of projects that uncertainty was not dealt with in 43 % of the documents, in 23 % uncertainty was suggested but not explained as uncertainty, 13 % indicated uncertainty without any further discussion, and only in 21 % uncertainty was explained or discussed at various levels. Similar findings are documented by e.g. Geneletti et al. (2003), Andrews (1988) and Dipper et al. (1998). Thus even though the SEA reports are an obvious place to discuss and document the uncertainties of climate change in urban planning, it seems questionable whether this is actually being done.

On this basis this paper will explore the question; **how is climate change uncertainty dealt with in SEA of urban planning in practice in Denmark?** And on the basis of this, discuss possible reasons for what we see in practice.

2. Methodology

To explore the question stated above, 125 Danish SEA reports were gathered and analysed in terms of how climate change had been integrated. The reports were chosen on the basis of the following parameters:

- Type of plan: covering local and comprehensive urban plans
- Region of origin: covering all the regions in Denmark
- Year of publication: covering the time from the implementation of SEA in Denmark to the end of 2009.

This allowed the identification of the characteristics shown in figure 2.

Type of plan	Comprehensive spatial plan	Local spatial plan
	75	50

Region	Capital Area	Zealand	South Denmark	Central Denmark	North Denmark
	36	25	19	28	17

Year of publication	2004	2005	2006	2007	2008	2009
	3	14	10	11	13	74

Figure 2 Characteristics of the SEA reports included in the document study

The reports were chosen to obtain a spread of the different characteristics. With regard to the comprehensive spatial plans, however, all published SEA reports are included in the study for the sake of

completeness. Regarding the time of publication, figure 2 shows very few reports the first year and many in 2009. This is because very few reports were published in the first years after SEA became mandatory in Denmark in 2004. The decision to include all municipal spatial plans is also relevant in this context, because the majority of these were published in 2009, when all Danish municipalities had to review their municipal spatial plans.

The SEA reports were analysed in terms of how climate change uncertainty has been integrated and thus the documents were searched for 'climate', 'CO_2' and 'energy'. The analysis is based upon Funtowicz and Ravetz (1990), who distinguish between three ways of presenting uncertainty: presentation of a range of results, characterisation of the methodological acceptability of results, and acknowledgement of ignorance about the system studied. In the case of communicating uncertainty in SEA, we therefore looked for expressions of uncertainty through:

1. Presentation of a range, quantitative or qualitative, of expected CO_2 emissions or climate change impacts, such as rise in sea level, change in precipitation, etc.
2. Presentation of acceptability of methodology used in the SEA. For instance the reliability of models for sea level rise in an area.
3. Acknowledgement of ignorance. It can e.g. be explicitly acknowledged an issue is uncertain, but that the assessment is made without further integration of uncertainty.

The results of the analysis are presented in the following section.

3. Dealing with climate change uncertainty in practice

In figure 2 the results of the document study can be seen. The figure shows that just over half of the reports include considerations of climate change, and that this is mostly concerned with climate change mitigation. Relatively few reports (17%) deal with climate change adaptation.

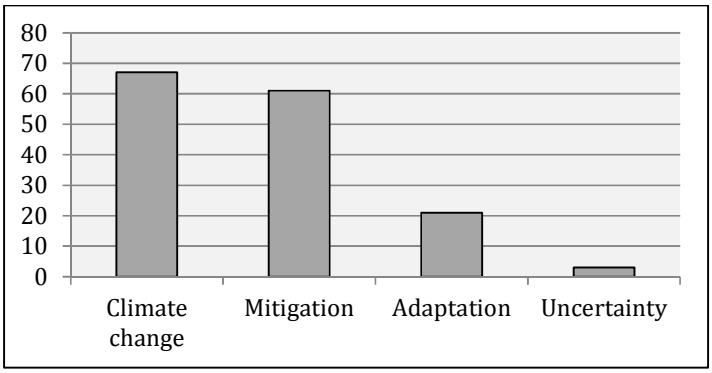

Figure 2 Number of SEA reports that include climate change, mitigation, adaptation and uncertainty

Figure 2 also shows that very few SEA reports mention climate change uncertainty. Only three of the 125 analysed reports have an explicit consideration of this. The considerations are presented in detail below:

Hjørring Municipality: Municipal spatial plan 2009

In this SEA report climate change is mentioned in relation to the environmental baseline with the wording: "*since the actual climate changes and the consequences of these for Hjørring Municipality are difficult to predict, among these the level of sea rise, the environmental baseline for climate change is thus subject to uncertainty and only indicates impacts*" (Hjørring Municipality 2009, 42).

Struer Municipality: Municipal spatial plan 2009

Like the previous report this SEA report addresses uncertainty of climate change consequences. It is stated that "*the actual climate changes and the consequences of these for Struer Municipality are difficult to predict*" and that the quantitative uncertainty means that the environmental baseline is uncertain (Struer Municipality 2009, 29-30).

Vesthimmerland Municipality: Municipal spatial plan 2009

In this SEA report, the same wording as in the report from Hjørring Municipality is used: "*since the actual climate changes and the consequences of these for Vesthimmerland Municipality are difficult to predict, among these the level of sea rise, the environmental baseline for climate change is thus subject to uncertainty and only indicates impacts*" (Vesthimmerland Municipality 2009, 30). Also, impacts on climate change in the form of CO_2 emissions are mentioned, since it is added that since these are dependent on the specific implementation, they are difficult to determine at an overall level of planning.

In accordance with the typology described in the previous section, all three SEA reports express uncertainty by acknowledging ignorance. That is by stating that there are uncertainties and things unknown about the future consequences of climate change but not specifying it further. The reports are all of the same type of plan, a comprehensive municipal spatial plan, from the same year, 2009, and prepared with assistance from the same consultancy. This may account for the similar wording.

It is important to note that climate change uncertainty can be tackled explicitly (e.g. documented in the SEA report) or implicitly (e.g. discussed by the person or group making the impact assessment but not documented in the report). This relates to the level of transparency in decision-making. In the investigation made, we studied the written documents, and are therefore not able to discuss the possible implicit handling of uncertainty, that might have taken place during the assessment process itself. Another issue concerning the empirical investigation is whether it is focussed on SEA-practitioners or the decision makers to which they relate. When reviewing SEA-reports we are investigating directly the SEA-practitioners' handling of uncertainty. However, it seems fair to assume that their actions to some degree reflect the attitudes of the decision makers that they are assigned to.

Following on from the claim that very few of the Danish SEA reports address climate change uncertainty in urban planning, in spite of the relevance and legislative demands, the following sections discuss and propose strategies and reasons for avoiding uncertainty.

4. Strategies for avoiding uncertainty

After seeing that climate change uncertainty is rarely dealt with in SEA of urban development it is interesting to look closer at the actual responses. Here we propose, based on examples and literature review, that there are different strategies that are more or less consciously followed when climate change uncertainties are avoided.

The first strategy discussed is *denying uncertainty*. In this strategy, uncertainty is explicitly denied either through denying that there is uncertainty or denying the relevance of the uncertain issue, in this case climate change. Denial can e.g. be in relation to "*the existence of climate change and human contribution to climate change, and could include more specific denial of the role that one's behavior or one's group's behaviors has in harming others*" (Swin et al. 2009, p. 126). According to Washington and Cook (2011, 1) denial is "*a refusal to believe something no matter what the evidence*". Washington and Cook point out various types of denial in relation to climate change, for example having impossible expectations such as stating that "*scientists can't even predict the weather next week, so how can they predict the climate years from now*" (Washington and Cook 2011, 47). Thus in this strategy climate change or climate change uncertainty would not be considered real or relevant and would not be part of the SEA.

The second strategy is *ignoring uncertainty*, where planning and assessment is carried on without regard for or mention of uncertainty. As stated by Dawes "*We often dread uncertainty. A common way of dealing with uncertainty in life is to ignore it completely, or to invent some "higher rationale" to explain it, often a rationale that makes it more apparent than real."* (Dawes 1988, p. 256). As a strategy, ignoring uncertainty is historically the most common one within policy analysis (Morgan and Henrion 1990), and by Quade viewed as "*a chronic disease of planners*" (Quade, 1975). The fact that climate change uncertainty is not mentioned at all in 18 of the 21 SEA reports dealing with climate change adaptation in the case study in this paper can be seen as an example of climate change uncertainty being ignored.

The third strategy is *postponing uncertainty*, based on the argument that the uncertain issues will be dealt with when more and better knowledge and information is present and thus uncertainty has been reduced. Postponement is in line with strategies like 'wait-and see' or 'business-as-usual'. An example of this strategy is the process around preparing river basin management plans in Denmark. Here the Danish state has chosen not to include effects of climate change on the water environment in the proces of setting goals and measures in the plans released in 2011. This is based on an argument that "*for setting environmental goals, changes in run-off and leaching it is evaluated that there is not sufficient scientific basis for including this in the først river basin management plans. This is expected to be assessed in the next generation of plans*" (Danish Ministry of Environment 2011, 7). Thus the state chose not to include climate change

because of uncertainty, but rather postpone this until the next generation of plans that are due in 2015 expecting to have gained the lacking knowledge by then (Larsen 2010).

The problems with not dealing with climate change uncertainties can be manifold. First of all the strategy of ignoring uncertainty and carrying on as if it does not exist can make assessments seem more certain than they are to decision makers and the public. Tennøy, Kværner and Gjerstad (2006) conclude from their study that "*EIA predictions are uncertain, but that decision-makers are not made aware of the prediction uncertainty. EIA predictions thus appear more certain than they are.*" This may be viewed as a democratic problem in terms of lack of transparency, but furthermore, it can be viewed as a problem that decisions and investments based on an outcome deemed certain, may prove inexpedient and difficult to change if events unfold differentlythan expected. An example of this is from the Danish experience of making river basin management plans. Here it has been argued that the lack of consideration of the uncertainty of climate change consequences may lead to environmental approvals being given to farmers, which must later be withdrawn or changed when climate change is integrated in the plans (Rothenborg 2010). As for the strategy of postponing uncertainty, it is worth noting that uncertainty is not always reducible through knowledge building. A stated by Walker et al. (2003) "*uncertainty is not simply the absence of knowledge*" and "*new information can either decrease or increase uncertainty*" since "*new knowledge on complex processes may reveal the presence of uncertainties that were previously unknown or were understated*". Thus postponing uncertainty may prove an inexpedient solution.

So consciously or not some form of strategy for avoiding climate change uncertainty is followed, the question then remains why avoidance is chosen? This is discussed in the following.

5. Reasons behind avoiding uncertainties

In this section we will follow up on the question of what the reasons are for avoiding uncertainty and propose two reasons; Conflict avoidance and reliance on quantification. The reasons we will suggest and discuss are based on literature and reflected in practice. There are other possible reasons, but these are the ones we have chosen to discuss within the scope of this paper.

Conflict avoidance. Avoidance of uncertainty can be due to conflict situations. Planners and decision-makers need to attain accountability and support for their decisions. Seen in this light uncertainty is threatening to planners and decision-makers, and makes them vulnerable to criticism and attack (Jaeger et al. 2001, p. 214). Thus planners and decision-makers could ignore uncertainty to avoid opening up for conflicts and opposition to their decisions. Dessai and Sluijs (2007, p. 11) point out the inexpedience of this argument for ignoring uncertainty when they state that not addressing uncertainties leaves "*…policies highly vulnerable to deconstruction in societal discourses and controversies on these policies*". Further they stress that such vulnerability can also be used in conflicts by those against a decision (Dessai and Sluijs

2007). Part of this reason can be that planners and decision-makers choose to ignore uncertainty in order to more or less deliberately create a (false) sense of security and instil trust (Lipshitz and Strauss, 1997).

Conflict avoidance may be exemplified by the process of preparing Danish RBMPs. The process has been highly contested especially because one of the most important threats to the water environment in Denmark is agriculture which is an important and strong business sector, which will be strictly regulated by the new plans. Two examples of how strongly the plans were contested are that the Minister of environment's own fellow party members refused to approve the draft plans (Jerking 2010) and that a farmer's association is currently planning a law suit against the Danish state due to the losses that farmers will suffer from the plans (DR 2012). As stated previously climate change has been excluded as an issue in the planning process, and in a contested process such as this it may not be surprising that planners or decision makers do not wish to base their planning on issues that are admittedly uncertain, since this might - rightly or not - be used as an argument against the plans.

Reliance on quantification. A perceived need for quantification of the assessment or of uncertainty can be part of the choice of not addressing uncertainty and uncertain issues, when quantification is not possible. Our propensity to quantify is described by Ben-Haim (2006, p. 9) and nicely captured in the statement that "*We are an age of number-givers, and the first advice to a novice in the modern world would be: if it stands still, measure it; if it moves, clock its speed*". Dessai and Sluijs (2007, p. 11) who propose that "*The focus on statistical and quantitative methods of uncertainty assessment leads to a tendency to ignore policy relevant uncertainty information about the deeper dimensions of uncertainty that in principle cannot be quantified*". As such planners and decision makers may avoid uncertainty because it does not always meet the demand for quantification. In a survey of perceptions of climate change among actors in the Baltic Sea Region one of the conclusions is that "*it is a popular fallacy that policy making should mainly be based on quantitative findings from science, a fallacy that hinders adequate action*" (Eisenack, Tekken and Kropp 2007, p. 9). Thus the lack of ability to quantify at times stand in the way of dealing approapriately with issues.

6. Conclusion

On the basis of the document study reported in this paper, we claim that in spite of the relevans of acknowledging climate change uncertainty in SEA or urban plans, most often uncertainty is avoided. When uncertainty is dealt with it is in the form of acknowledged ignorance related to the possible consequences of climate change. It can be viewed as a problem that climate change uncertainties are not included in the SEA reports, since this means that the basis for assessment and thus planning may be uncertain but that it seems certain, and that planners and decision makers are thus exposed to making inexpedient plans and decisions.

It is proposed in this paper that there are three strategies when avoiding uncertainty in assessments of impacts:

- Denying uncertainty

- Ignoring uncertainty
- Postponing uncertainty

Further two reasons for choosing one of these strategies are discussed. One is a need or wish to avoid conflict, especially in already contested situations where explicit acknowledment of uncertainty may spark further unrest and lack of trust in authority. Another reason proposed is reliance on quantification, which relates to our percieved need to quantify issues, also in planning and assessment, and a notion that when either uncertainty or an uncertain issue cannot be quantified, this may be avoided.

The strategies and reasons are based on literature coupled with reflections on current practice. However, as they stand now they are proposals for discussion and further theoretical and empirical investigations.

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